



Irrigation and Soil Salinization in Mediterranean agro-ecosystem

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During the warm and dry growing season of Mediterranean climates, the availability of good quality water for primary production in agriculture tends to be limited. This aspect makes the use of saline and brackish water appealing, given the potential of natural flushing of the soils by deep percolation during the wet and colder dormant season. Thus the cyclic alternation between the two different phases in the cold and warm season gives rise to a delicate equilibrium that can lead to long term secondary salinization if the mean salt input from irrigation overpasses the average annual natural leakage amount. The main goal of this study is to evaluate the long term salt mass balance in the presence of irrigation and possible changes in seasonality. An elevated concentration of salt in the soil may in turn lead to both a decrease of its fertility and to osmotic stress reducing plant productivity. To this purpose, a stochastic soil and water balance salinity model is developed to quantify the balance between salt accumulation phases during the growing season and leaching phases during the wet season. We provide the numerical and the analytical representation of secondary long-term salinization process, highlighting the role of soil depth, plant and climate together with the impact of shifts in the seasonal vs. interannual rainfall fluctuations. An application to a test case in the Southern part of Sicily (ITALY) is also presented, highlighting the strong relationship between salt dynamics, water management and climatic conditions.